#6/ Response w/Ext(3) Granted 10/3/03

PATENT
Attorney Docket No.: AirIP13

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Examiner: Nguyen
NORMAN et al.	Art Unit: 2819
Application No.: 09/930,822	
Filed: August 15 2001 For: Ring Oscillator Dynamic Adjustments for Auto Calibration	**RESPONSE**

Commissioner for Patents
PO Box 1450
Alexandria, VA

Sirs:

The Office Action rejected claims 1-20 as unpatentable over Ma (USPN 4,746,879) and Cole (USPN 6,476,682). The Office Action noted that:

> Regarding claim 1 & 11-15, Ma et al. discloses a temperature compensated oscillator circuit of the claimed invention, including, among other things: a temperature sensor having a digital temperature output (Fig. 4: 140 combined with the A/D circuit of the CPU 130); a register (or EEPROM 20) coupled to the sensors for storing the digital output values (Fig. 1 and column 5, lines 9-24); and a memory device (EE PROM 143) coupled to the register via the CPU 130 for storing data (line 29 of col. 9 to line 68 of col. 10), the reference does not explicitly disclose a voltage sensor circuit. However, the claimed voltage sensor comprises a voltage divider, having resisters RO-R1. This voltage divider circuit

is similar to the voltage divider disclosing in the prior art, Fig. 4: resistors R1-R2. This voltage divider circuit combined with the A/D circuit of the CPU 130 will generate digital voltage output. Therefore, it would have been obvious to one person having ordinary skill in the art at the time the invention was made to implement the voltage divider (R1-R2) combined with the A/D of the CPU 130 circuit as a voltage sensor having digital voltage output (column 9, lines 11-17) for the purpose of providing an oscillating frequency which is stabilized against temperature variations and other factors affecting the frequency (column 1, lines 6-12). Office Action at pages 2-3.

Ma relates to a digitally temperature compensated oscillator (TCO) system is provided which is capable of ascertaining and memorizing in an EEPROM-based look-up table, appropriate digital values of a temperature-compensating tuning voltage to the TCO during calibration. An on-board temperature sensing mechanism tracks variations in temperature in the TCO and produces an analog voltage value corresponding to the instantaneous temperature. The voltage value of the sensor output is digitized and designated to constitute an address into the EEPROM based look-up table. As the temperature changes, the digitized output of the temperature sensor and hence the address to the EEPROM changes accordingly. The TCO tuning voltage value corresponding to the address represented by the measured temperature is extracted from the values stored within the EEPROM table and then converted into a corresponding analog voltage which is used to drive the voltage-controlled oscillator (VCO) in order to maintain the output frequency of the TCO stabilized at a desired value. The EEPROM contained within the TCO is preferably calibrated during production, under the control of a calibration and test circuit which regulates the calibration and testing of a TCO in a chamber whose temperature is ramped over a desired temperature range. The TCO includes an on-board microprocessor which allows integration of several of the TCO functions, including the analog-to-digital and the storage and retrieval of data to and from the EEPROM containing the look-up table and extremely simplifies the calibration and test procedure.

As noted in the office action, Ma does not show an **integrated** voltage sensor circuit. Cole shows a device with an **external** crystal and a single integrated circuit

wherein the integrated circuit has a temperature sensing circuit with a digital output, control circuitry, a memory circuit and a switched capacitor array for compensating the oscillation of the crystal oscillator over temperature.

In contrast, claim 1 provides for an apparatus to compensate for voltage and temperature variations **on an integrated circuit** with a voltage sensor having a digital voltage output; a temperature sensor having a digital temperature output; a register coupled to the voltage sensor and the temperature sensor, the register adapted to concatenate the digital voltage output and the temperature output into an address output; and a memory device having an address input coupled to the address output of the register, the memory device being adapted to store one or more corrective vectors.

There is absolutely no showing of an integrated circuit with both voltage sensor and temperature sensor on the integrated circuit. The combination of Ma and Cole shows a device with external components, not integrated components. Moreover, there is no showing of a register connected to both. The EEPROM 20 mentioned in the office action does not correspond to the claimed register. Additionally, there is no showing of corrective vectors in the combination. Each of the foregoing is an independent basis for traversing the Section 103 rejection on the independent claims.

Applicant notes that the present rejection does not establish *prima facie* obviousness under 35 U.S.C. § 103 and M.P.E.P. §§ 2142-2143. The Examiner bears the initial burden to establish and support *prima facie* obviousness. *In re Rinehart*, 189 U.S.P.Q. 143 (CCPA 1976). To establish *prima facie* obviousness, three basic criteria must be met. M.P.E.P. § 2142. First, the Examiner must show some suggestion or motivation, either in the Ma reference or in the knowledge generally available to one of ordinary skill in the art, to modify the reference so as to produce the claimed invention. M.P.E.P. § 2143.01; *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). Secondly, the Examiner must establish that there is a reasonable expectation of success for the modification. M.P.E.P. § 2142. Thirdly, the Examiner must establish that the prior art references teach or suggest all the claim limitations. M.P.E.P. §2143.03; *In re Royka*, 180 U.S.P.Q. 580 (CCPA 1974). The teachings, suggestions, and reasonable

expectations of success must be found in the prior art, rather than in appellant's disclosure. *In re Vaeck*, 20 U.S.P.Q.2d 1438 (CAFC 1991). Applicant respectfully submits that a *prima facie* case of obviousness has not been met because the Examiner's rejection fails on at least two of the above requirements.

As to the dependent claims, these claims are allowable since they depend from allowable independent claims.

Additionally, Applicant notes that no motivation or suggestion, either in the cited art reference or in the knowledge generally available to one of ordinary sill in the art, has been cited by the Examiner to modify the Ma reference so as to produce the claimed invention. As noted above, the Ma reference fails to teach or suggest he claimed apparatus to compensate for voltage and temperature variations on an integrated circuit with a voltage sensor having a digital voltage output; a temperature sensor having a digital temperature output; a register coupled to the voltage sensor and the temperature sensor, the register adapted to concatenate the digital voltage output and the temperature output into an address output; and a memory device having an address input coupled to the address output of the register, the memory device being adapted to store one or more corrective vectors.

One skilled in the art would not have been motivated to combine the references to arrive at an on-chip solution. The difficulty lies in accurately controlling the output of the ring-oscillator. Such a system needs to adjust the right oscillator output every few clock cycles, or even every clock cycle on slower systems. This kind of speed can only be achieved with an on-chip application. The systems using external oscillators are typically much slower, making corrections every few milliseconds to every few seconds, whereas our system makes corrections as fast as they can be loaded from the on-chip memory (tens of nanoseconds). Therefore, the system discussed in the instant specification is truly "real-time", in that it can make corrections before the clock imprecision causes the processor to malfunction.

In sum, one skilled in the art would not be motivated to combine or modify Ma with Cole as suggested, since systems based on ring oscillators typically have a 10%

frequency stability, whereas a processor requires a 100ppm precision. In a system that performs the correction every 1ms, the processor can execute 100k instructions, and many of these instructions would have incorrect timing. This is completely different from a crystal, which has 100ppm precision and which needs to be adjusted only once in a while due to temperature drift.

Applicant points out that the Examiner bears the initial burden of factually establishing and supporting any *prima facie* conclusion of obviousness. *In re Rinehart*, 189 U.S.P.Q. 143 (CCPA 1976); M.P.E.P. § 2142. If the Examiner does not produce a *prima facie* case, the Applicant is under no obligation to submit evidence of nonobviousness. *Id.* In the instant case, the Examiner has not pointed to any evidence in Ma, or how knowledge of those skilled in the art, provide a suggestion or motivation to modify the reference teaching so as to produce the claimed invention of claim 1 for an apparatus to compensate for voltage and temperature variations on an integrated circuit with a voltage sensor having a digital voltage output; a temperature sensor having a digital temperature output; a register coupled to the voltage sensor and the temperature sensor, the register adapted to concatenate the digital voltage output and the temperature output into an address output; and a memory device having an address input coupled to the address output of the register, the memory device being adapted to store one or more corrective vectors. See *In re Zurko*, 59 U.S.P.Q.2d 1693 (Fed. Cir. 2001) ([I]n a determination of patentability .... the Board cannot simply reach conclusions based on its understanding or experience - or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings).

Under *Vaeck*, absent any evidence of a cited suggestion or reasonable motivation in the Ma reference, or knowledge of those skilled in the art, for an apparatus to compensate for voltage and temperature variations on an integrated circuit with a voltage sensor having a digital voltage output; a temperature sensor having a digital temperature output; a register coupled to the voltage sensor and the temperature sensor, the register adapted to concatenate the digital voltage output and the temperature output into an

address output; and a memory device having an address input coupled to the address output of the register, the memory device being adapted to store one or more corrective vectors, *prima facie* obviousness of claim 1 (and dependent claims) has not been established. As such, it is respectfully requested that the § 103(a) rejection of independent claims 1 and 11 (and those dependent therefrom) be withdrawn and the claims be allowed.

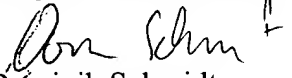
CONCLUSION

Applicant believes that the above discussion is fully responsive to all grounds of rejection set for the in the Office Action.

A check for $465 covering a 3 month extension request is enclosed.

If for any reasons the Examiner believes a telephone conference would in any way expedite resolution of the issues raised in this response, the Examiner is invited to telephone the undersigned.

Respectfully submitted,



Dominik Schmidt